LIGHT STRING USING A CLADDING TO SCATTER LIGHT FROM LIGHT EMITTING DIODES TO PRESENT A NEON LIGHT EFFECT

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a light string, and more particularly to a light string with a cladding outside the light emitting diodes (LEDs) to scatter the light from the LEDs so as to present a neon light effect.

2. Description of Related Art

With reference to Fig. 12, a conventional light string has a core (110), two wires (120,130), multiple axial holes (140) or multiple radial holes (150a,150b,150c,150d,150e) to receive therein multiple light emitting diodes (160a,160b,160c) and connection wires (170a,170b) for interlinking each of the LEDs (160a,160b,160c). The LEDs (160a,160b,160c) are alternately received in the radial holes (150a,150b,150c,150d,150e) such that the connection wires (170a,170b) are sandwiched between two adjacent LEDs (160a,160b,160c) after the connection wires (170a,170b) are alternately received in the radial holes (150a,150b,150c,150d,150e). A transparent cladding (180) is then formed outside the core (110).

If the light string with the core (110) has only axial holes (140) for receiving therein LEDs (160a,160b,160c), the light string is called the Horizontal-Type and if the light string with the core (110) has only radial holes (150a,150b,150c,150d,150e), the light string is called the Vertical-Type.

US Pat. No. 4,607,317 issued on August 19, 1986 discloses a light string with better safety, packaging, installation, use and maintenance features

than any other existing light string. However, the light string can not solve the shortcoming that the light from the LEDs is not continuous. That is, this light string still uses the LEDs as the light source without any modification to soften the dotted-effect from the LEDs.

US Pat. No. 6,186,645 issued on February 13, ***2001*** discloses a Horizontal-Type light string having the capability to scatter the light from the LEDs. However, the light from the LEDs is not sufficiently softened and thus still does not emit a soft and continuous light when compared with a neon light in the market.

US Pat. No. 6,565,251 B2 issued on May 20, 2003 discloses a light string having a core and a cladding outside the core. The core and the cladding may have different shapes such as circular, square, oval or even wave-like. At least one axial space may be defined between the core and the cladding so that the at least one axial space may be filled with insulation fluid to improve the light scattering and reflection. Although this light string claims to have the capability to emit a soft and continuous light effect as that of a neon light, there is no definite structure to show how the light is reflected and/or refracted.

To overcome the shortcomings, the present invention tends to provide an improved light string to mitigate the aforementioned problems.

SUMMARY OF THE INVENTION

The primary objective of the present invention is to provide an improved light string using a cladding to scatter the light from the light emitting diodes to present a soft and continuous light.

Other objects, advantages and novel features of the invention will

become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing the light string of the present invention;

Fig. 2 is a cross sectional view showing the internal structure of the light string of the present invention;

Fig. 3 is a schematic perspective view showing the formation of a cladding outside the core and the scattering body on top of the core;

Fig. 4 is a schematic view showing the light effect from the light string of the present invention;

Fig. 5 is a perspective view showing the second embodiment of the light string of the present invention;

Fig. 6 is a cross sectional view of the light string in Fig. 5;

Fig. 7 is a perspective view of the third embodiment of the light string of the present invention;

Fig. 8 is a cross sectional view of the light string in Fig. 7;

Fig. 9 is a perspective view showing another embodiment of the light string of the present invention;

Fig. 10 is a cross sectional view of the light string in Fig. 9;

Fig. 11 is a perspective view of a conventional light string; and

Fig. 12 is a schematic view showing the application of the light string of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to Figs. 1 and 2, the light string constructed in accordance with the present invention includes a core (02), a scattering body (08) and a cladding (09) enclosing the core (02) and the scattering body (08).

The core (02) has multiple radial holes (03a,03b,03c,03d) defined in a side of the core (02) to alternately receive therein light emitting diodes (LEDs) (04a,04b) and two connection wires (01a,01b) are received in the other side in the core (02) relative to the radial holes (03a,03b,03c,03d). Because the two connection wires (01a,01b) are on one side in the core (02) and the LEDs (04a,04b) received in the radial holes (03a,03b,03c,03d) are on the other side of the core (02), when the light string is bent, the stretching force to either one of the two connection wires (01a,01b) is the same so that difficulty in bending the light string and breakage of the connection wires (01a,01b) are avoided.

It is to be noted that the LEDs (04a,04b) are alternately received in the radial holes (03a,03c) and thus the radial holes (03b,03d) are left to receive therein a joint (05) between two LEDs (04a,04b) and a resistor (06).

After the LEDs (04a,04b) are received in the radial holes (03a,03c) in the core (02), the core (02) passes through a through hole (21) in extruding machine (20) with a scattering body (08) which is made of a lacteous material, as shown in Fig. 3. A soft material, e.g. PVC, (22) enters the extruding machine (20) and encloses the core (02) and the scattering body (08) to form a cladding (09) outside the scattering body (08) and the core (02). The cladding (09) has an arcuate top face (10) on top of the scattering body (08) and the LEDs (04a,04b). Furthermore, the LEDs (04a,04b) are located below the scattering body (08) and preferably below the center line B-B of the scattering body (08).

1

It is noted from the teaching that the width and height of the scattering body (08) are proportional to the brightness and the angle of the LEDs. In this embodiment of the present invention, the LEDs (04a,04b) each have a diameter of 3-5mm, a brightness of 200 Mcd and an angle of emission of 45 degrees. The radial holes (03a,03c) are equally spaced apart (1/2 inch) from each other. The scattering body (08) has a height of 14mm and a width of 8mm. A mediate portion (11) sandwiched between the scattering body (08) and the LEDs (04a,04b) is a portion of the cladding (09) and has a thickness (S1) of 2mm. The arcuate top face (10) of the cladding (09) has a thickness (S2) of 2mm.

Referring to Figs. 2 and 3 and with reference to Fig. 4, it is noted that the light beam from the LEDs (04a,04b) passes through the mediate portion (11), the scattering body (08) and the arcuate top face (10) such that edges of the light beams from adjacent LEDs (04a,04b) are overlapped. After the light beams from the LEDs (04a,04b) are refracted by the mediate portion (11) and the arcuate top face (10) and scattered by the scattering body (08), the overlapped effect to the edges of adjacent LEDs (04a,04b) light beams causes central regions between two adjacent LEDs (04a,04b) to have a brightness substantially the same as the brightness from the center of the LEDs (04a,04b). Therefore, it is expected that the lighting effect of the light string of the present invention is able to present a soft and continuous light beam. An electrical plug (14) is integrally formed with the connection wires (01a,01b) by a cable (13) for providing electricity to the LEDs (04a,04b) and a stopper (15) is integrally formed opposite to the electrical plug (14),however, as the plug and stopper are

conventional in the art detailed descriptions thereof are thus omitted.

In order to enhance the lighting effect of the present invention, two opposite sides and a bottom of the cladding (09) may be coated with an opaque layer (16), as shown in Figs. 1 and 2, preferably a black paint (18), as shown in Figs. 5 and 6.

A converter (17), as shown in Fig. 1 is added to the light string of the present invention to change alternate current to direct current such that flashing of the LEDs is avoided and thus the LEDs are able to emit a steady and continuous light beam.

A different embodiment of the present invention is shown in Figs. 5 and 6, wherein the scattering body (08) in the first embodiment and the cladding (09) are integrally formed into one piece. Therefore, the height (H2) of the cladding (09) on top of the core (02) is slightly smaller than a sum of the scattering body (H), thickness (S1) of the arcuate top face (10) and the thickness of the mediate portion (11) in the embodiment in Figs. 1 and 2 and is 16mm. The width of the arcuate top face (10) is 8mm.

Still another embodiment is seen in Figs. 7 and 8, wherein a passage(20) is defined in the cladding (09) on top of the core (02). Due to the scattering effect of air inside the passage (20) being inferior to the scattering body (08) in the first embodiment, the height (H3) of the cladding (09) on top of the core (02) should be larger than the height (H2) in the embodiment disclosed in Figs. 5 and 6.

With reference to Figs. 9 and 10, another embodiment shows that the core (02) and the cladding (09), as shown in the previous embodiments, are

integrally formed into one piece. Thereafter, axial holes (03) are spatially defined in the light string to receive therein LEDs.

With reference to Fig. 11, after the light string of the present invention is formed, a clamp (30) may be applied to fasten the light string on a board (31). Because the opposite sides of the cladding (09) are coated with the opaque layer (16), light beams from the LEDs can only be emitted from the arcuate top face (10) of the cladding (09), which is able to emit a continuous and soft light beam the same as a neon light.

It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.